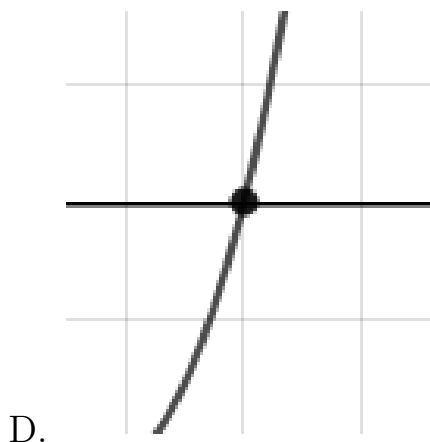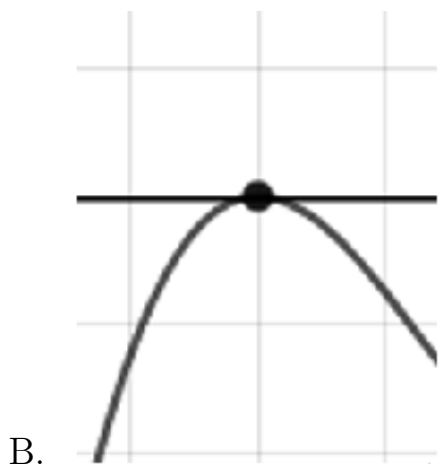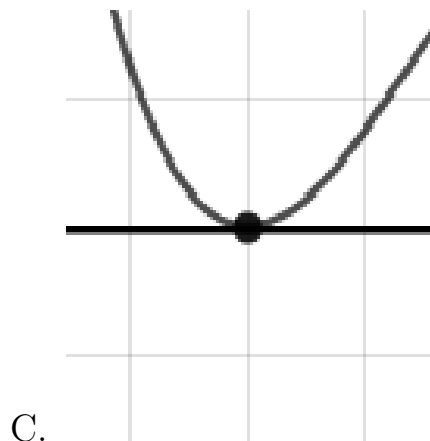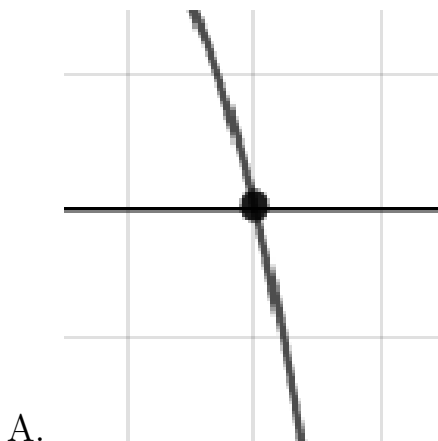1. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$\frac{-4}{5}, \frac{-1}{2}, \text{ and } \frac{2}{5}$$

   A. $a \in [47, 51], b \in [44, 46], c \in [-10, -4],$ and $d \in [5, 10]$

   B. $a \in [47, 51], b \in [-86, -79], c \in [41, 48],$ and $d \in [-11, -2]$

   C. $a \in [47, 51], b \in [-50, -44], c \in [-10, -4],$ and $d \in [5, 10]$

   D. $a \in [47, 51], b \in [44, 46], c \in [-10, -4],$ and $d \in [-11, -2]$

   E. $a \in [47, 51], b \in [-35, -28], c \in [-16, -10],$ and $d \in [5, 10]$
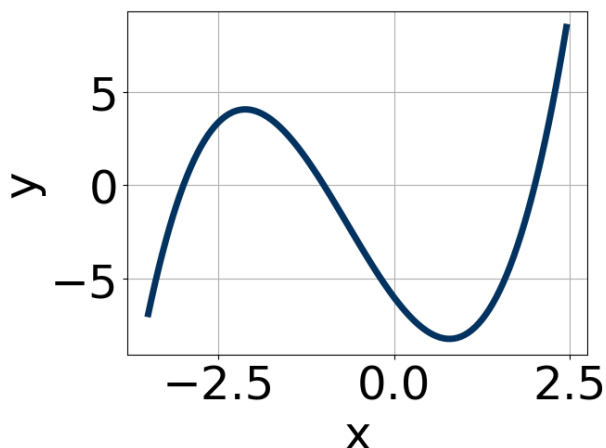
---

2. Describe the zero behavior of the zero $x = 4$ of the polynomial below.

$$f(x) = -5(x+4)^6(x-4)^7(x+5)^3(x-5)^6$$

A.

C.

B.

D.

    E. None of the above.

3. Which of the following equations *could* be of the graph presented below?

    A. $17(x-2)^8(x+1)^9(x+3)^{11}$

    B. $-7(x-2)^4(x+1)^7(x+3)^{11}$

    C. $15(x-2)^7(x+1)^5(x+3)^7$

    D. $-2(x-2)^{11}(x+1)^9(x+3)^9$

    E. $7(x-2)^{10}(x+1)^8(x+3)^{11}$

---

4. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$-4 - 2i \text{ and } -1$$

    A. $b \in [0,4], c \in [4.37, 5.42],$ and $d \in [2.7, 4.8]$

    B. $b \in [6,11], c \in [27.08, 28.41],$ and $d \in [14.4, 20.2]$

    C. $b \in [-9,-7], c \in [27.08, 28.41],$ and $d \in [-20.3, -18.9]$

    D. $b \in [0,4], c \in [0.79, 4.62],$ and $d \in [-0.4, 3.2]$
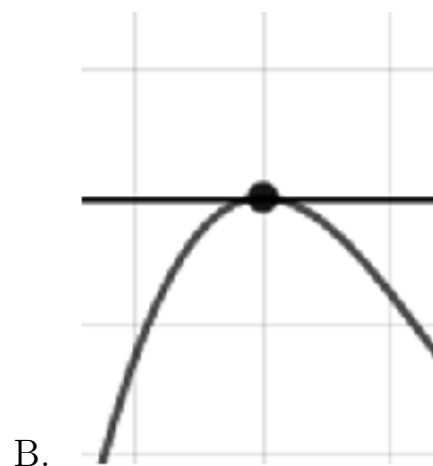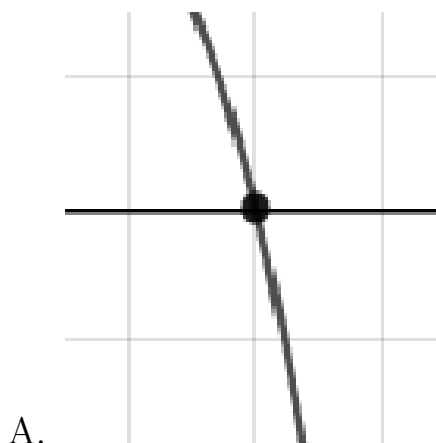
    E. None of the above.

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5. Which of the following equations *could* be of the graph presented below?
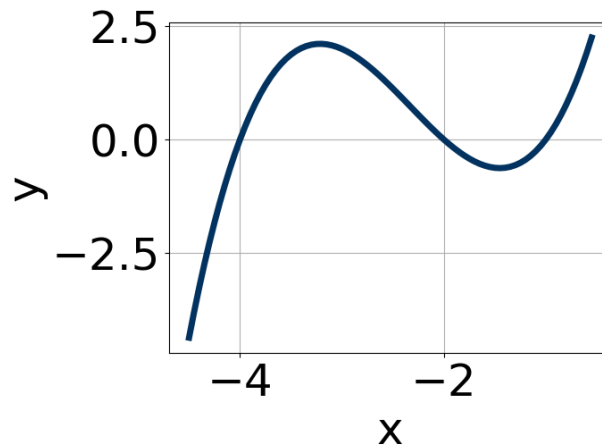
    A. $-7(x+1)^5(x+2)^9(x+4)^9$

    B. $10(x+1)^{10}(x+2)^5(x+4)^7$

    C. $9(x+1)^9(x+2)^7(x+4)^{11}$

    D. $-2(x+1)^{10}(x+2)^5(x+4)^5$
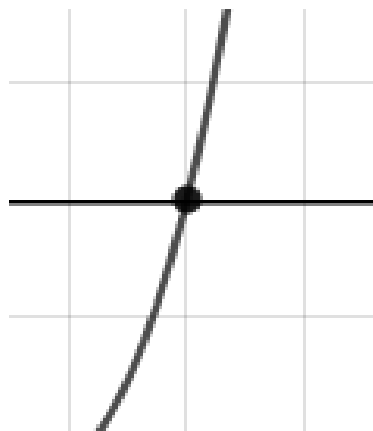
    E. $20(x+1)^{10}(x+2)^8(x+4)^9$

---

6. Describe the zero behavior of the zero $x = 3$ of the polynomial below.

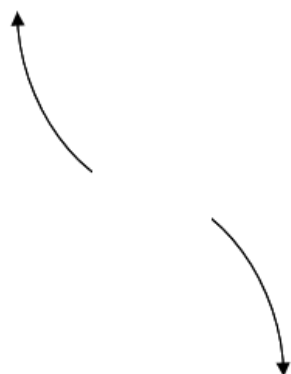$$f(x) = 6(x+5)^4(x-5)^2(x+3)^{13}(x-3)^8$$

A.

B.

C.   D.

E. None of the above.

___

7. Describe the end behavior of the polynomial below.
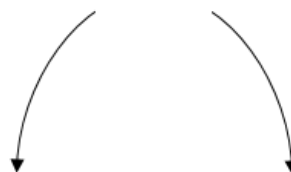
$$f(x) = -9(x-5)^3(x+5)^8(x-6)^4(x+6)^6$$
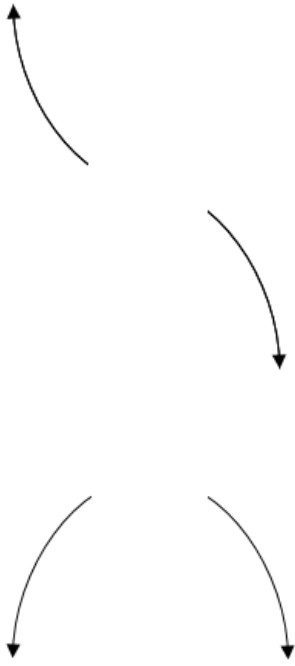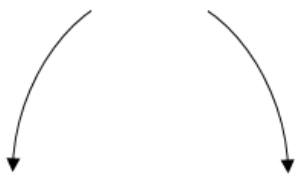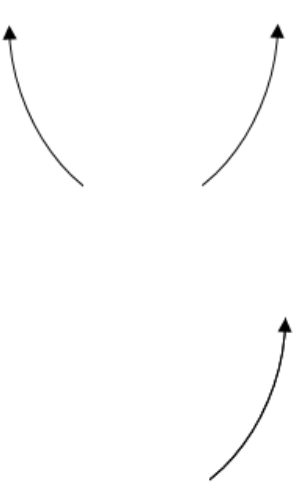

C.

A.

B.   D.

E. None of the above.

8. Describe the end behavior of the polynomial below.

$$f(x) = 2(x+2)^2(x-2)^7(x+8)^4(x-8)^4$$

A.

B.

C.

D.

E. None of the above.

---

9. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$\frac{4}{3}, \frac{7}{5}, \text{ and } \frac{-1}{3}$$

A. $a \in [44, 48], b \in [-108, -105], c \in [40, 50], \text{ and } d \in [-28, -27]$

B. $a \in [44, 48], b \in [9, 14], c \in [-86, -82], \text{ and } d \in [-28, -27]$

C. $a \in [44, 48], b \in [127, 141], c \in [121, 128], \text{ and } d \in [25, 34]$

D. $a \in [44, 48], b \in [-108, -105], c \in [40, 50], \text{ and } d \in [25, 34]$

E. $a \in [44, 48], b \in [107, 110], c \in [40, 50], \text{ and } d \in [-28, -27]$

10. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$-5 - 3i \text{ and } 1$$

A. $b \in [4, 14], c \in [23.5, 25.2],$ and $d \in [-34.6, -33]$

B. $b \in [-5, 6], c \in [3.8, 6.7],$ and $d \in [-6.8, -4]$

C. $b \in [-10, -2], c \in [23.5, 25.2],$ and $d \in [33.9, 36.6]$

D. $b \in [-5, 6], c \in [-1.7, 3.3],$ and $d \in [-3.6, -0.7]$
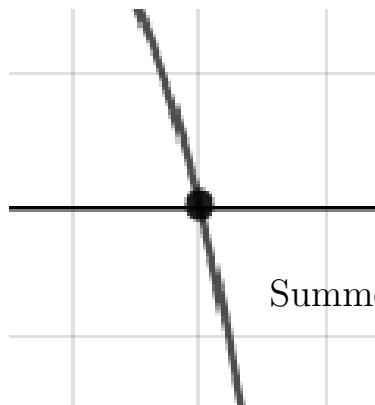
E. None of the above.

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11. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.
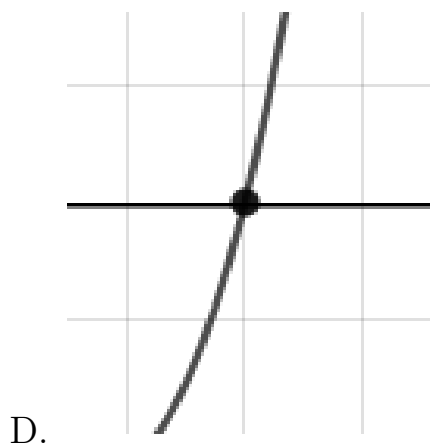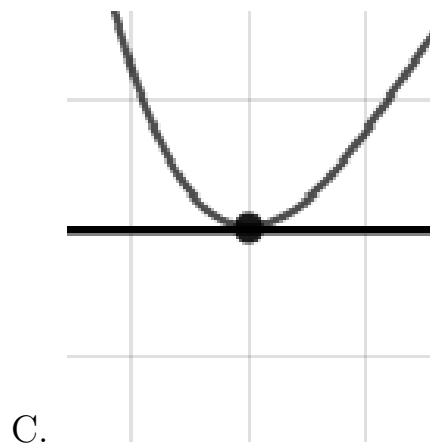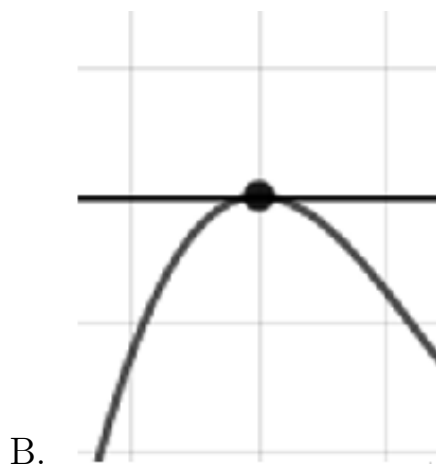
$$\frac{5}{3}, \frac{-1}{4}, \text{ and } \frac{-5}{2}$$

A. $a \in [23, 25], b \in [-28, -20], c \in [-98, -94],$ and $d \in [21, 27]$

B. $a \in [23, 25], b \in [106, 107], c \in [123, 131],$ and $d \in [21, 27]$

C. $a \in [23, 25], b \in [26, 29], c \in [-98, -94],$ and $d \in [21, 27]$

D. $a \in [23, 25], b \in [26, 29], c \in [-98, -94],$ and $d \in [-26, -21]$

E. $a \in [23, 25], b \in [90, 99], c \in [74, 78],$ and $d \in [-26, -21]$

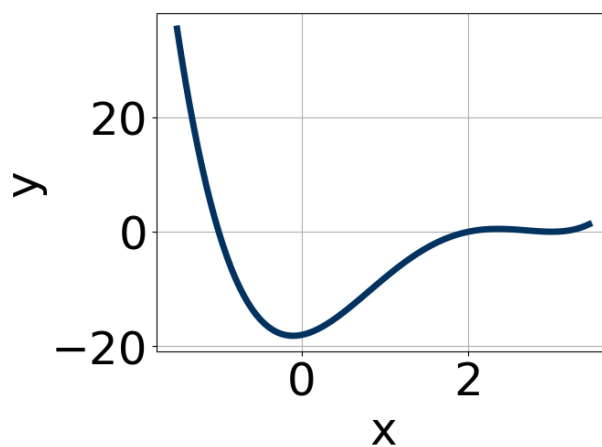12. Describe the zero behavior of the zero $x = -3$ of the polynomial below.

$$f(x) = -2(x-3)^4(x+3)^7(x+2)^7(x-2)^{10}$$

B.

C.

D.

E. None of the above.

---

13. Which of the following equations *could* be of the graph presented below?


A. $18(x-3)^4(x-2)^{10}(x+1)^{11}$

B. $5(x-3)^{10}(x-2)^{11}(x+1)^{11}$

C. $-14(x-3)^{10}(x-2)^{11}(x+1)^4$

D. $18(x-3)^7(x-2)^4(x+1)^7$

E. $-10(x-3)^4(x-2)^9(x+1)^{11}$

---

14. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$-3 - 4i \text{ and } -3$$

A. $b \in [-3, 3], c \in [6.2, 9.3],$ and $d \in [12, 14]$

B. $b \in [-12, -8], c \in [42, 47.2],$ and $d \in [-75, -74]$

C. $b \in [9, 13], c \in [42, 47.2],$ and $d \in [72, 82]$

D. $b \in [-3, 3], c \in [2.5, 6.7],$ and $d \in [5, 11]$

E. None of the above.

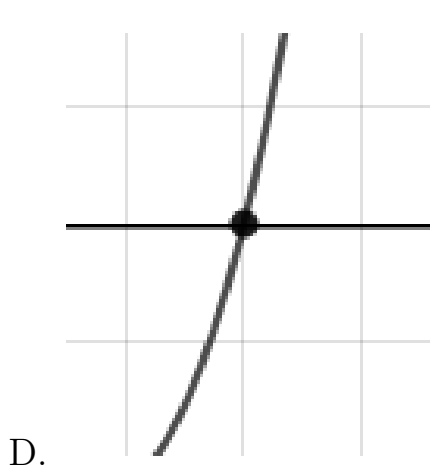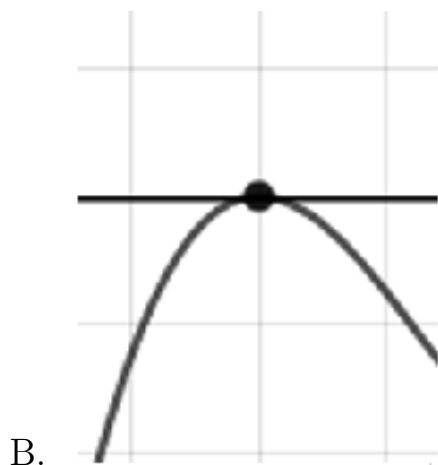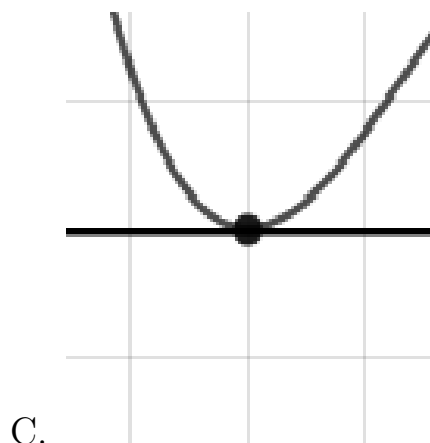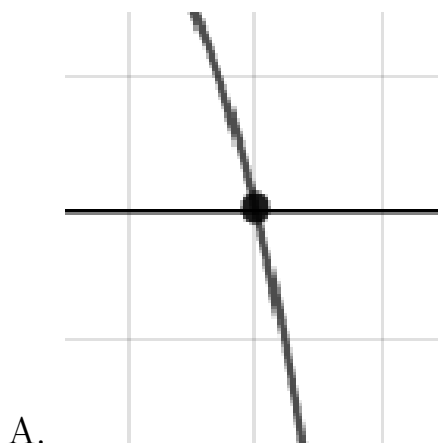15. Which of the following equations *could* be of the graph presented below?
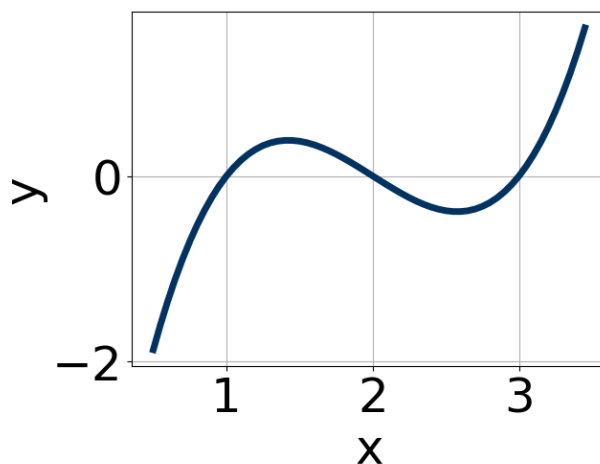
A. $-20(x-1)^8(x-2)^9(x-3)^5$

B. $20(x-1)^8(x-2)^5(x-3)^7$

C. $-5(x-1)^{11}(x-2)^{11}(x-3)^5$

D. $4(x-1)^7(x-2)^5(x-3)^9$

E. $7(x-1)^8(x-2)^6(x-3)^7$

---

16. Describe the zero behavior of the zero $x = 5$ of the polynomial below.
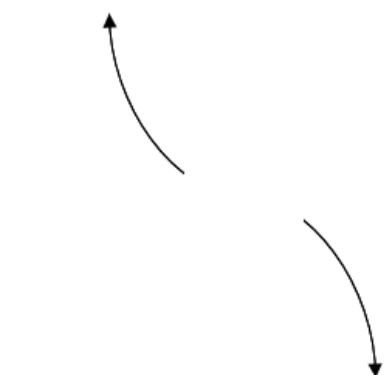
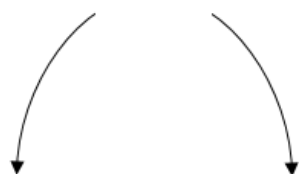$$f(x) = 4(x-2)^6(x+2)^3(x-5)^7(x+5)^2$$

A.

C.

B.

D.

E. None of the above.

---

17. Describe the end behavior of the polynomial below.
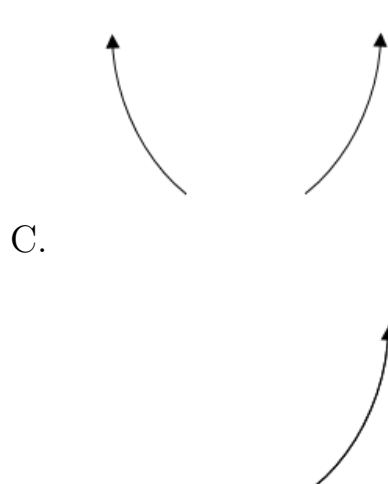
$$f(x) = -2(x+2)^3(x-2)^8(x-9)^4(x+9)^6$$

A.

B.   D.

C.
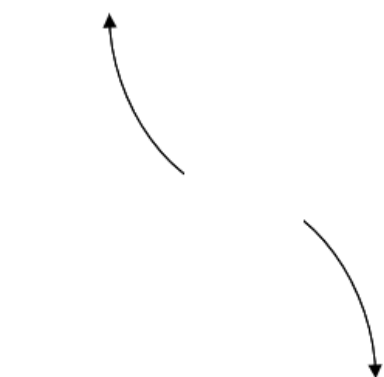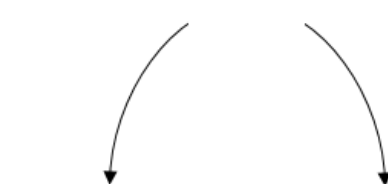
E. None of the above.

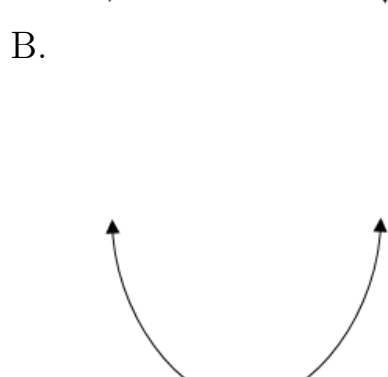
18. Describe the end behavior of the polynomial below.

$$f(x) = -4(x-5)^5(x+5)^8(x-4)^5(x+4)^5$$

A.

B.

C.

D.

E. None of the above.

---

19. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$\frac{4}{3}, \frac{1}{4}, \text{ and } 1$$

A. $a \in [11, 21], b \in [-0.6, 2.1], c \in [-19.5, -16.4], \text{ and } d \in [2, 6]$

B. $a \in [11, 21], b \in [1.5, 8.2], c \in [-16, -14.6], \text{ and } d \in [-6, 0]$

C. $a \in [11, 21], b \in [30.9, 32.5], c \in [20.5, 27.3], \text{ and } d \in [2, 6]$

D. $a \in [11, 21], b \in [-32.9, -28.5], c \in [20.5, 27.3], \text{ and } d \in [-6, 0]$

E. $a \in [11, 21], b \in [-32.9, -28.5], c \in [20.5, 27.3], \text{ and } d \in [2, 6]$

---

20. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$-2 + 3i \text{ and } -1$$

A. $b \in [0.1, 3.9], c \in [-7, 0], \text{ and } d \in [-5.5, -1.1]$

B. $b \in [-10.8, -3], c \in [12, 26], \text{ and } d \in [-14.5, -9.4]$

C. $b \in [0.1, 3.9], c \in [2, 8], \text{ and } d \in [0.4, 3.8]$

D. $b \in [2.5, 6.7], c \in [12, 26],$ and $d \in [12.3, 16.1]$
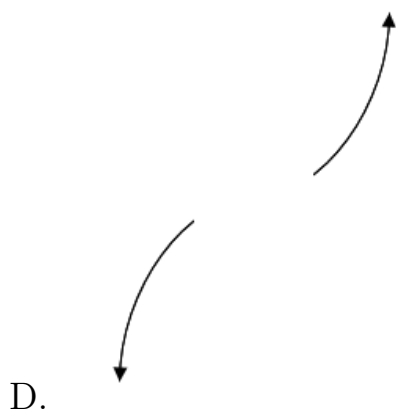
E. None of the above.

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21. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$\frac{7}{4}, \frac{-7}{5}, \text{ and } \frac{5}{2}$$

A. $a \in [39, 49], b \in [114, 119], c \in [-65, -62],$ and $d \in [-247, -238]$

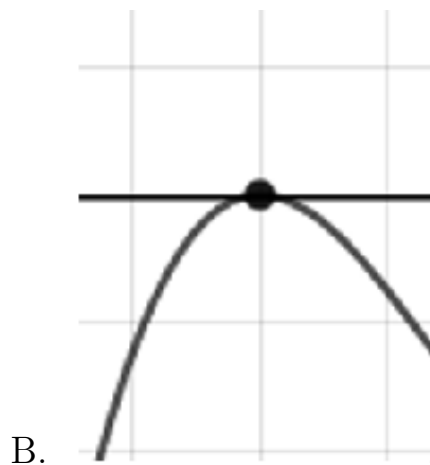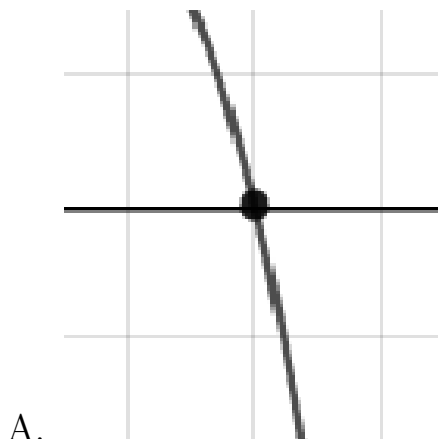B. $a \in [39, 49], b \in [-87, -83], c \in [-137, -129],$ and $d \in [241, 248]$

C. $a \in [39, 49], b \in [-115, -112], c \in [-65, -62],$ and $d \in [241, 248]$

D. $a \in [39, 49], b \in [-115, -112], c \in [-65, -62],$ and $d \in [-247, -238]$

E. $a \in [39, 49], b \in [25, 29], c \in [-220, -214],$ and $d \in [-247, -238]$
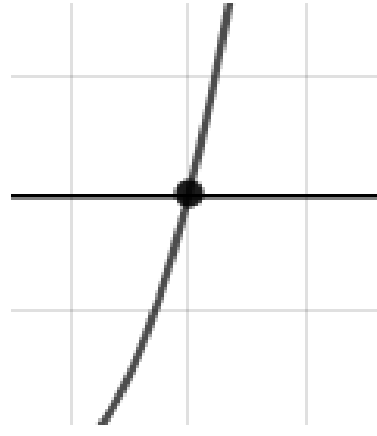
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22. Describe the zero behavior of the zero $x = -8$ of the polynomial below.

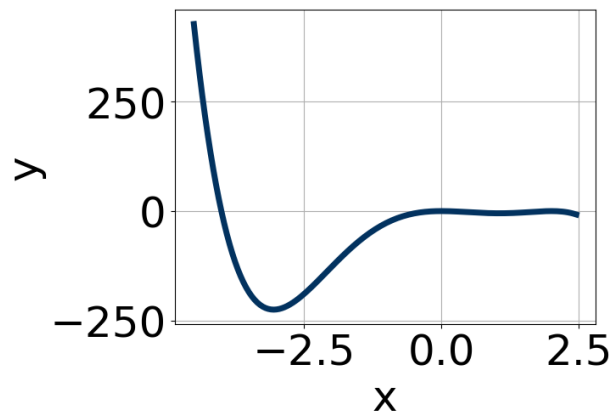$$f(x) = 3(x + 7)^{11}(x - 7)^9(x - 8)^8(x + 8)^5$$

A.

B.

C.

D.

E. None of the above.

---

23. Which of the following equations *could* be of the graph presented below?

A. $-20x^4(x-2)^8(x+4)^{11}$

B. $-4x^8(x-2)^{11}(x+4)^7$

C. $6x^4(x-2)^6(x+4)^8$

D. $-7x^8(x-2)^5(x+4)^8$

E. $14x^6(x-2)^{10}(x+4)^7$

---

24. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in

the form $x^3 + bx^2 + cx + d$.

$$-5 - 3i \text{ and } -2$$

A. $b \in [-1, 10], c \in [6.99, 8.99],$ and $d \in [7, 12]$

B. $b \in [-16, -10], c \in [53.47, 55.02],$ and $d \in [-72, -63]$

C. $b \in [-1, 10], c \in [4.6, 5.04],$ and $d \in [1, 7]$

D. $b \in [11, 13], c \in [53.47, 55.02],$ and $d \in [68, 69]$

E. None of the above.

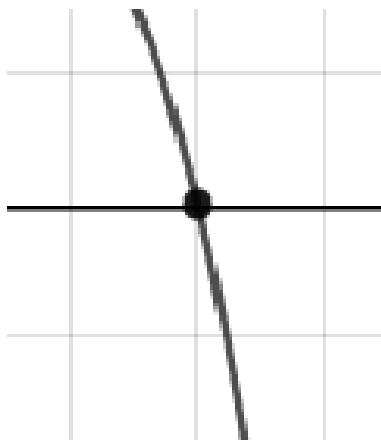25. Which of the following equations *could* be of the graph presented below?
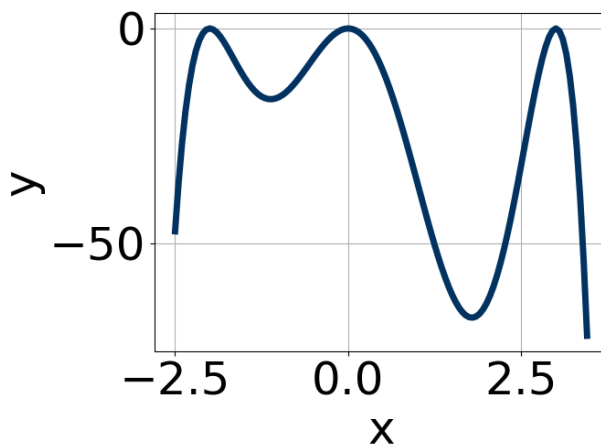
A. $-13x^{10}(x - 3)^4(x + 2)^{11}$

B. $11x^4(x - 3)^4(x + 2)^4$

C. $-17x^4(x - 3)^{10}(x + 2)^4$

D. $-8x^8(x - 3)^7(x + 2)^7$

E. $12x^{10}(x - 3)^{10}(x + 2)^{11}$

26. Describe the zero behavior of the zero $x = 3$ of the polynomial below.

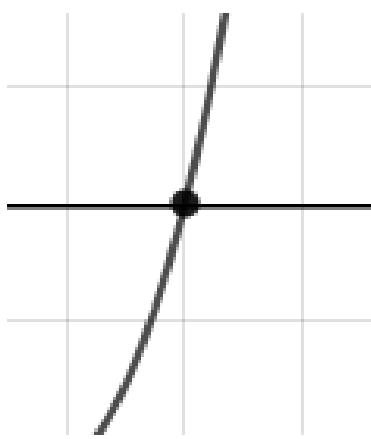$$f(x) = 5(x - 3)^5(x + 3)^{10}(x + 9)^6(x - 9)^{10}$$
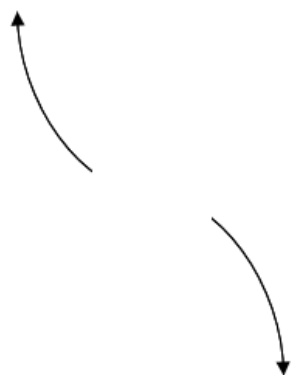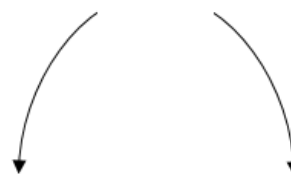
A.

C.

B.

D.

E. None of the above.
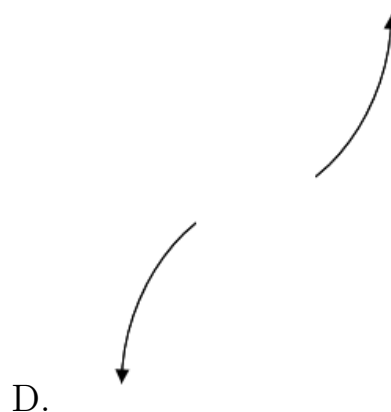
27. Describe the end behavior of the polynomial below.

$$f(x) = 2(x + 7)^3(x - 7)^8(x - 2)^2(x + 2)^4$$

B.

A.

C.

D.

E. None of the above.

28. Describe the end behavior of the polynomial below.
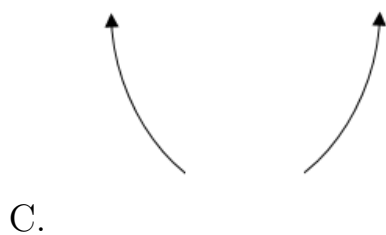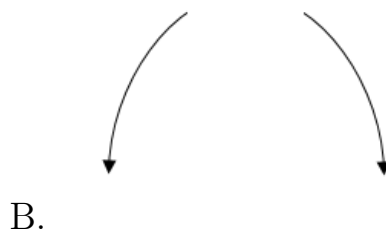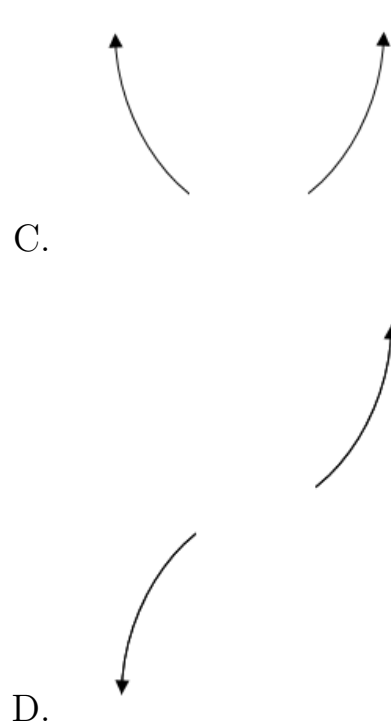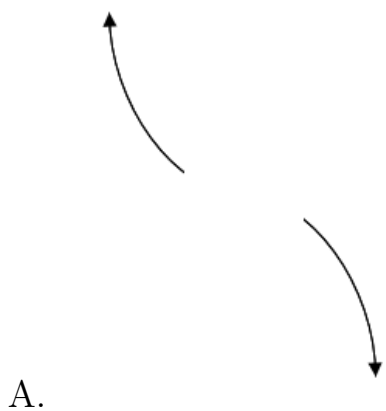
$$f(x) = -8(x-9)^4(x+9)^5(x+2)^4(x-2)^5$$

A.

C.

B.

D.

E. None of the above.

29. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$\frac{-1}{4}, \frac{-1}{5}, \text{ and } \frac{4}{5}$$

A. $a \in [97, 105], b \in [-39, -33], c \in [-38, -27], \text{ and } d \in [2, 6]$

B. $a \in [97, 105], b \in [-125, -121], c \in [36, 47], \text{ and } d \in [-7, -2]$

C. $a \in [97, 105], b \in [-87, -79], c \in [-1, 8], \text{ and } d \in [2, 6]$

D. $a \in [97, 105], b \in [-39, -33], c \in [-38, -27], \text{ and } d \in [-7, -2]$

E. $a \in [97, 105], b \in [32, 40], c \in [-38, -27], \text{ and } d \in [2, 6]$

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30. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$3 - 3i \text{ and } 4$$

A. $b \in [-1, 7], c \in [-6, 0], \text{ and } d \in [-14, -11]$

B. $b \in [-1, 7], c \in [-8, -2], \text{ and } d \in [10, 13]$

C. $b \in [5, 20], c \in [34, 44], \text{ and } d \in [72, 78]$

D. $b \in [-10, -5], c \in [34, 44], \text{ and } d \in [-77, -69]$

E. None of the above.